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SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER	
WERNER, DAVID N	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/790,138	SONG ET AL.	
	Examiner	Art Unit	
	David N. Werner	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-16 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-16 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office action for US Patent Application 10/790,138 is in response to communications filed 28 September 2007, in reply to the non-final rejection of 28 June 2007. Currently, claims 1-16 are pending. Of those, claims 14-16 are new.

2. In the previous Office action, claim 13 was rejected under 35 U.S.C. 101 as non-statutory, claim 11 was rejected under 35 U.S.C. 102(b) as anticipated by US Patent 5,731,850 A (Maturi et al.), and claims 1-10, 12, and 13 were rejected under 35 U.S.C. 103(a) as obvious over Maturi et al. in view of US Patent Application Publication 2002/0168008 A1 (Ishikawa) and US Patent 5,878,166 A (Legall).

Response to Amendment

3. Applicant's amendment to the specification has been considered. The rejection of claim 13 under 35 U.S.C. 101 has been withdrawn.

4. Applicant's arguments with respect to claims 1, 6, and 11-13 have been considered but are moot in view of the new ground(s) of rejection. Applicant argues, first, that the "entire macroblock SAD" in Maturi et al., determined by a process that "independently cumulates the SAD for the odd-odd field and the SAD for the even-even field and then merely adds these two SADs together rather than independently computing a SAD for the entire macroblock" does not correspond with the claimed "frame SAD"; second, that Maturi et al. does not teach "identifying a minimum value" of

received SAD values; third, that Ishikawa does not teach selecting a motion compensation mode if a minimum SAD value is smaller than a threshold; fourth, that Legall does not disclose selecting an interpolative motion compensation mode; and fifth, that there was no motivation to combine the references cited in the previous Office action.

In response to the first and second arguments, a new reference is introduced to show that a video encoder having a separate frame SAD generator and a field SAD generator, in which the determination of a MC mode is determined by selecting the smaller of the field SAD or frame SAD was known at the time of the invention.

In response to the third argument, new references are introduced to show that producing an interpolated frame if the distortion produced by forward and backward motion vectors exceeds a threshold was known at the time of the invention.

In response to the fourth argument, Legall is no longer relied upon for teaching material in the independent claims, or specifically, step (c) of independent claim 1, nor was it relied on in the prior art rejection for selecting a specific frame MC mode or specific field MC mode. Instead, Legall was used to teach encoding a macroblock or a frame as a general field or frame mode based on an activity level, based on total field or frame activity level, under step (d) of independent claim 1. Legall is currently relied on only for teaching claims 4, 5, 9, and 10, which are extensions of the material of step (d) of claim 1.

In response to the fifth argument, Maturi is no longer used to teach making a determination of forward/backward motion compensation, Ishikawa is no longer relied

upon as prior art, and as shown above, Legall is not used to teach the material of step (c) of claim 1. New primary reference US Patent 5,539,466 A (Igarashi et al.) is instead relied upon to teach determining a specific forward or backward frame or field motion compensation mode, as will be shown further below.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 11 and 14-16 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 11 and 14-16 specifically exclude determining an MC mode from an interpolative frame SAD, an interpolative top field SAD, and an interpolative bottom field SAD. This directly contradicts paragraph [22] of the specification, which reads, "An MC mode determination unit 150 compares the 9 SADs calculated and output by each unit describe above to each other, and determines a final MC mode. The 9 SADs are an interpolative frame SAD (SAD_intp_fr), and interpolative field SAD (SAD_intp_tf), an interpolative bottom field SAD (SAD_intp_bf)...". Therefore, the amendments to claims 11 and 14-16 constitute new

matter. See MPEP 706.03(o), "New matter includes...the omission of a step from a method".

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claim 11 is rejected under 35 U.S.C. 102(b) as being anticipated by US Patent 5,539,466 A (Igarashi et al). Igarashi et al. teaches a coder for interlaced pictures. In one embodiment of Igarashi, shown in figure 1, macroblock data is sent to a frame motion detector 22 and a field motion detector 21 (column 12: lines 40-42). Frame motion detector 22 detects motion vectors between the current frame and surrounding frames, and SAD values between the current frame and surrounding frame, and outputs frame motion vector FMMV and frame sum of absolute differences FMAD (column 12: lines 50-54). In case of a B picture, the frame motion vector is chosen from the one of forward motion vector FMVB, backward motion vector BMVB, and a bidirectional motion vector which is the average of FMVB and BMVB, which produces the least predictive error (column 19: lines 1-14). Field motion detector 21, similarly, detects motion vectors between the current fields, and outputs field motion vector FDMV and field sum of absolute differences FDAD (column 12: lines 44-49). In case of a B frame, the field motion vector is chosen from the one of forward FMVoBo between the previous odd

field and current odd field, forward FMVeBo between the previous even field and the current odd field, forward FMVoBe between the previous odd field and the current even field, forward FMVeBe between the previous even field and the current even field, backward BMVoBo between the next odd field and the current odd field, backward BMVeBo between the next even field and the current odd field, BMVoBe between the next odd field and the current even field, and BMVeBe between the next even field and the current even field, which produces the least predictive error (column 19: lines 15-40). Next, the frame and field SAD values are transmitted to a prediction mode judgment circuit 23 (column 12: lines 56-60), which determines if motion prediction will be carried out in a field mode or frame mode by comparing the frame SADs to the field SADs. If the difference FMAD-FDAD is greater than a threshold T1, then a field mode is chosen, but if the difference FMAD-FDAD is smaller than T1, a frame mode is chosen (column 13: lines 6-21). If threshold T1 is set to 0, then the determination of field mode or frame mode is directly measured from the minimum of field or frame SADs, since the inequality $FMAD - FDAD > 0$ implies $FMAD > FDAD$.

The portions of the Field Motion Detector and Frame Motion Detector that find forward motion vectors in Igarashi et al. correspond with the claimed "forward SAD calculation unit", the portions of the Field Motion Detector and Frame Motion Detector that find backward motion vectors correspond with the claimed "backward SAD calculation unit", and the prediction mode judgment circuit corresponds with the claimed "MC mode determination unit".

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1-3, 6-8, and 12-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 5,539,466 A (Igarashi et al.), in view of US Patent 5,731,850 A (Maturi et al.), in view of US Patent 5,168,356 A (Acampora et al.), and in view of US Patent 5,185,819 A (Ng et al.).

As shown above, Igarashi et al. discloses determining whether to perform motion compensation on a macroblock in a frame mode or a field mode based on determining a minimum SAD value. However, Igarashi et al. does not disclose a motion compensation mode in which a sum of a top field SAD and a bottom field SAD is determined, nor defaulting to an interpolative motion compensation mode if all SAD values are above a threshold.

As applicant recognizes, in Maturi et al., in an "entire macroblock" coding mode, "Motion Estimator 56 independently cumulates the SAD for the odd-odd field and the SAD for the even-even field and merely adds these two SADs together" (column 12: lines 4-10), as well as a calculation of cumulating the SAD for the odd-even field and even-odd field (column 12: lines 11-19). The one of these two cumulative modes that produces the minimum SAD is selected as the "entire macroblock" coding mode

(column 12: lines 28-33). Notice that the column 12 table of Maturi shows a cumulative "entire macroblock" coding mode for both forward and backward coding.

Igarashi et al. discloses portions of the claimed invention, but not determining the sum of a top field SAD and a bottom field SAD. Maturi et al. teaches that it was known to produce a motion compensation mode from the sum of an odd field SAD and the sum of an even field SAD. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the cumulative SAD generator of Maturi et al. to the field motion detector of Igarashi et al., since Maturi et al. states in column 12: line 10 that such a modification would add a new option for a motion compensation mode without calculating additional motion vectors.

Maturi et al. does not, however, resolve the deficiency of only selecting a motion compensation mode if a minimum SAD value is below a threshold, and encoding in an interpolative field or frame mode if the minimum SAD value is above a threshold.

Acampora et al. teaches a video encoder. This encoder includes element 104 which calculates a forward frame motion vector (column 7: lines 44-52), element 105 which calculates a backward frame motion vector (column 7: lines 53-56), and analyzer 106, which compares the distortion produced from the forward and backward motion vectors to a threshold (column 7: lines 57-58). If both the forward and backward frame distortions are larger than a threshold, a weighted interpolated frame according to the ratio of distortions is generated (column 7: lines 57-66). If the distortion signals are below the threshold, the motion vector that produces the smaller distortion is selected (column 7: line 67–column 7: line 3).

Ng et al. discloses a field mode version of the forward and backward motion vector generators and analyzer of Acampora et al. (column 7: lines 1-28).

Igarashi et al., combined with Maturi et al., discloses the claimed invention except for producing an interpolated frame or field if the motion vectors are above a threshold. Acampora et al. and Ng et al. teach that it was known to produce an interpolated data block if forward and backward motion vectors are above a threshold. Therefore, it would have been obvious to one having ordinary skill in the art to add the motion vector analyzers of Acampora et al. and Ng. et al. to the video coder of Igarashi et al., since Acampora et al. states in column 7: lines 57-67 that such a modification would produce a less distorted inter picture than from motion vectors alone if the motion vectors are unreliable.

Regarding claims 2, 3, 7, and 8, in Igarashi et al., the frame motion vector mode that produces a minimum predictive error is selected as the frame motion vector (column 19: lines 8-10), the field motion vector mode that produces a minimum predictive error is selected as the field motion vector (column 20: lines 8-11) and the decision to chose the field mode or frame mode may be determined by which of the two produces a smaller sum of absolute differences (column 13: lines 6-21). In addition, in Maturi et al., the "entire macroblock" mode derived from the sum of an even field SAD and an odd field SAD is the one that produces a minimum SAD (column 12: lines 30-33), and in Acampora et al. and Ng et al., the motion vector that produces the minimum

distortion signal is chosen as the motion vector if the distortion signals are below a threshold (column 8: lines 1-3).

Regarding claims 14-16, in Acampora et al. and Ng et al., the new distortion signal generated for the interpolated block is not used to determine whether to encode a block in a forward mode, backward mode, or interpolated mode, but only as a weighting factor once it has already been decided to encode the block in an interpolated mode.

11. Claims 4, 5, 9, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Igarashi et al., Maturi et al., Acampora et al., and Ng et al. as applied to claims 1 and 6 above, and further in view of US Patent 5,878,166 A (Legall). Claims 4, 5, 9, and 10 are directed to selecting an interpolated field mode or interpolated frame mode based on SAD statistics. Acampora et al. teaches only interpolated frame motion compensation, and Ng et al. teaches only interpolated field motion compensation.

Legall teaches a video encoding method. Regarding claims 4, 5, 9, and 10, in Legall, a choice is made for each frame whether to encode the frame in a frame mode or in a field mode (column 3: lines 24-29). In addition, in a frame mode, individual macroblocks may be encoded in a field mode or a frame mode (column 10: line 63– column 11: line 14). This decision is made by comparing a "frame activity" measure, which is the sum of absolute differences for every pixel in a block, and the sum of the two "field activity" measures (column 8: lines 41-54). If the frame activity is less than the field activity, a macroblock is encoded with frame encoding, but otherwise a macroblock is encoded with field encoding (column 11: lines 7-14). This corresponds

with the claimed comparison of the sum of forward frame SAD and backward frame SAD and the sum of forward and backward field and frame SADs in claims 4 and 9 and the "combination of SADs" in claims 5 and 10.

Igarashi et al., Maturi et al., Acampora et al., and Ng et al., when combined, disclose the claimed invention except for determining whether to encode a block in a field mode or frame mode based on total SAD values of the field mode and frame mode. Legall teaches that it was known to make a field mode/frame mode determination for a macroblock based on comparing total SAD values of a frame and the sum of the SAD values of two fields. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to choose between frame mode and field mode based on total SAD activity, as taught by Legall, since Legall states in column 3: lines 24-54 that such a modification would enable an encoder to adapt to an optimized encoding mode with a more stable bit rate depending on the amount of movement in a video.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent 5,175,618 A (Ueda et al.) teaches a compression system for interlaced images. US Patent 5,633,682 A (Tahara) teaches a 3D coding system in which the two fields of an interlaced image are alternatively delivered to the left and right eyes. US Patent 5,648,819 teaches a motion estimator with a frame mode and a field mode. US Patent 5,770,787 A (Takashima et al.) teaches a motion vector

system in which an odd field vector and an even field vector are generated. US Patent 6,094,225 A (Han) teaches an encoder that produces a frame mode and a field mode. US Patent 6,263,024 B1 (Matsumoto et al.) teaches an image coding system that produces a macroblock as a field block or a frame block. US Patent 6,449,312 B1 (Zhang et al.) teaches a motion estimation system in which SAD values are computed for frames and fields.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner whose telephone number is (571) 272-9662. The examiner can normally be reached on Monday-Friday from 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

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DNW

Mehrdad Dastouri
MEHRDAD DASTOURI
SUPERVISORY PATENT EXAMINER
TC 2600